

an isolation film <31> provided in an upper layer part of said SOI layer for isolating said plurality of element forming regions from each other;

a first conductivity type semiconductor region <11, 12> provided under said isolation film as part of said SOI layer, said semiconductor region being formed in contact with at least one of said plurality of element forming regions having a first conductivity type among said plurality of element forming regions; and

Q2 a first conductivity type body region <10> provided in said SOI layer and capable of being externally fixed in electric potential, said body region being in contact with said semiconductor region, wherein

said semiconductor region at least partially has a first conductivity type impurity region not mixed with an impurity of a second conductivity type different from said first conductivity type but doped by only an impurity of said first conductivity type.

Q3 10. (Amended) The semiconductor device according to claim 1, wherein said isolation film includes a portion having a thickness of not more than 50 nm.

REMARKS

At the time of the Office Action dated December 13, 2002, claims 1-24 were pending in this application. Of those claims, claims 1-11 have been rejected and claims 12-24 have been withdrawn from consideration pursuant to the provisions of 37 C.F.R. § 1.142(b). Claims 1 and 10 have been amended to address minor informalities. Claim 11 has been cancelled. Applicants submit that the present Amendment does not generate any new matter issue.

In the second enumerated paragraph of the statement of the rejection, the Examiner asserted that the title of the invention was not descriptive. In response, the Title has been changed to --SEMICONDUCTOR DEVICE HAVING IMPURITY REGION UNDER ISOLATION REGION--.

In the third enumerated paragraph of the statement of the rejection, the Examiner objected to the specification for various informalities. In response, Applicants have amended the specification per Examiner's suggestion.

In the fifth enumerated paragraph of the statement of the rejection, the Examiner objected to claim 10, asserting that the term "an isolation film" seems to be redundant. In response, Applicants have amended claim 10 to recite that "said isolation film includes a portion," and Applicants respectfully submit that this amendment to claim 10 has addressed the Examiner's objection.

In the sixth enumerated paragraph of the Office Action, the Examiner objected to Figs. 33-36 of the drawings pursuant to M.P.E.P. § 608.02(g), requiring that which is old be labeled as "PRIOR ART." In response, it is proposed to amend Figs. 33-36, as indicated in red on the attached photocopies, to label these figures as prior art. Also, accompanying this Amendment is a Request for Approval of Drawing Amendment and proposed drawing corrections for Figs. 33-36 with the changes indicated in red ink.

Claim 1 is rejected under the first paragraph of 35 U.S.C. § 112

In the eighth enumerated paragraph of the Office Action, the Examiner asserted that the "prescribed element" is critical or essential to the practice of the invention, and therefore, must be contained in the claim. More specifically, the Examiner appears to believe that the transistor recited in claim 6, which is recited as a prescribed element, is the critical or essential element. This rejection is respectfully traversed.

The case law cited by the Examiner is inapplicable, as this ~~case~~^{law} involves a situation in which the critical feature was not recited in the claims. In contrast, a "prescribed element" is recited in claim 1. Furthermore, Applicants note that a transistor is but one example of a "prescribed element," as it is well known in the art of semiconductor manufacturing to form features other than transistors on a semiconductor substrate. Thus, by reciting a "prescribed element" in claim 1, the claimed invention is not limited to only one (i.e., a transistor) of many possible "prescribed elements" known in the art. Applicants would also note that the Examiner has failed to establish that the transistor is "critical or essential to the practice of the invention." The Examiner asserting that an element is critical or essential is not enough; instead, the Examiner must establish why the element is critical or essential to the practice of the invention. Applicants submit that the imposed rejection of claim 1 under the first paragraph of 35 U.S.C. § 112 has been overcome and, hence, Applicants respectfully solicit withdrawal thereof.

Claim 1 is rejected under the second paragraph of 35 U.S.C. § 112

In the first enumerated paragraph of the Office Action, the Examiner asserted a lack of antecedent basis for the recitation "said semiconductor region" in lines 14 and 15 of claim 1.

This rejection is respectfully traversed.

Initially, Applicants note that line 9 of claim 1 also recites "said semiconductor region," but this term was not mentioned in the Examiner's rejection. As line 8 of claim 1 recites "a first conductivity type semiconductor region," it is apparent that said semiconductor region in line 9 refers to "a ... semiconductor region" in line 8. A review of claim 1 yields no other instances where "a ... semiconductor region" is recited. As such, one having ordinary skill in the art would recognize that the terms "said semiconductor region" found in lines 14 and 15 of claim 1 refer to "a ... semiconductor region" in line 8. The modifier "first conductivity type" is not required to be used each time when referring to the semiconductor region. As to language in line 10 of claim 1, Applicants have amended claim 1 per Examiner's suggestion. Thus, the imposed rejection of claim 1 under the second paragraph of 35 U.S.C. § 112 has been overcome and, hence, Applicants respectfully solicit withdrawal thereof.

Claims 1-9 and 11 are rejected under 35 U.S.C. § 102 for lack of novelty as evidenced by Flaker et al., U.S. Patent No. 6,410,369 (hereinafter Flaker)

In the twelfth enumerated paragraph of the Office Action, the Examiner asserted that Flaker discloses a semiconductor device corresponding to that claimed. This rejection is respectfully traversed.

The factual determination of lack of novelty under 35 U.S.C. § 102 requires the identical disclosure in a single reference of each element of a claimed invention, such that one having ordinary skill in the art would have recognized that the identically claimed invention is within the public domain.¹ Furthermore, the Examiner must also establish that the applied reference identically discloses each feature of the claimed invention.² As part of this analysis, the Examiner must (a) identify the elements of the claims, (b) determine the meaning of the elements in light of the specification and prosecution history, and (c) identify corresponding elements disclosed in the allegedly anticipating reference.³ The Examiner's rejection failed to meet this burden, as the Examiner neither clearly designated the teachings in the reference being relied upon by the Examiner nor clearly explained the pertinence of the applied prior art. In this regard, the Examiner's rejection also fails to comport to the provisions of 37 C.F.R. § 1.104(c).⁴

Referring to the first paragraph on page five of the Office Action, the Examiner has merely copied the language of the claims into this paragraph and asserted that Flaker identically discloses the claimed invention. The only specific features identified by the Examiner are the oxide isolation 40 and "body link" shown in Fig. 10B of Flaker. The Examiner referred to Fig. 8 for the remaining features, but did not clearly designate where these features are shown in Fig. 8 or described in the disclosure of Flaker.

¹ ATD Corporation v. Lydall, Inc., 159 F.3d 534, 48 USPQ2d 1321 (Fed. Cir. 1998); Electro Medical Systems S.A. v. Cooper Life Sciences, Inc., 34 F.3d 1048, 32 USPQ2d 1017 (Fed. Cir. 1994).

² In re Rijckaert, 9 F.3d 1531, 28 USPQ2d 1955 (Fed. Cir. 1993); Lindermann Maschinenfabrik GMBH v. American Hoist & Derrick Co., 730 F.2d 1452, 221 USPQ 481 (Fed. Cir. 1984).

³ Lindermann Maschinenfabrik GMBH v. American Hoist & Derrick Co., *supra*.

⁴ 37 C.F.R. § 1.104(c) provides:

In rejecting claims for want of novelty or for obviousness, the examiner must cite the best references at his or her command. When a reference is complex or shows or describes inventions other than that claimed by the applicants, the particular part relied on must be designated as nearly as practicable. The pertinence of each reference, if not apparent, must be clearly explained and each rejected claim specified.

For example, claim 1 recites "a first conductivity type body region <10> provided in said SOI layer and capable of being externally fixed in electric potential, said body region being in contact with said semiconductor region." However, a review of Flaker fails to yield where this feature is disclosed. Claim 1 also recites that "said semiconductor region at least partially has a first conductivity type impurity region." A first conductivity type impurity region indicates that this region has been doped with impurities of a first conductivity type. A review of Flaker, however, fails to yield where the "body link" of Flaker has been doped with any impurities. It is therefore apparent that Flaker does not identically describe the claimed invention within the meaning of 35 U.S.C. § 102.

As to the claimed "dummy regions" in claims 7-9, the Examiner must interpret the meaning of the claimed limitations in light of the specification. As such, prior to asserting that a reference identically discloses the claimed regions "dummy regions," the Examiner must interpret the term "dummy regions" in light of the specification. The Examiner has failed to do so. Instead, the Examiner has created his own meaning for the term "dummy regions." As such, the Examiner's rejection as to claims 7-9 is flawed.

Furthermore, the Examiner identified a "body link 32" in Figs. 8 and 10B of Flaker as corresponding to the first conductivity type semiconductor region recited in claim 1. The body link 32 of Flaker is provided in a silicon layer of a P-type (first conductivity type), so that the body line 32 contains P-type impurities. However, according to Flaker, a surface of a portion of the silicon layer where the body link 32 is to be formed is covered with oxide films 52, 56 during

a process of implanting arsenic ions, as shown in Fig. 13, and it is almost impossible to completely prevent arsenic ions from being introduced into the portion where the body link 32 is to be formed by only providing the oxide films 52, 56. As such, in the process shown in Fig. 13, arsenic ions would inevitably be introduced into the portion where the body link 32 is to be formed. Thus, the body link 32, as formed, would contain N-type (second conductivity type) impurities, as well as P-type impurities.

In contrast, the recited semiconductor region includes a first conductivity type impurity region formed of only first conductivity impurities. According to the present invention, a N^+ block region 41 is provided in a N^+ block resist 51 during implantation of N-type impurities to thereby obtain the first conductivity type impurity region, for example, as shown in Figs. 10 and 11. The provision of the N^+ block region 41 completely prevents N-type impurities from being introduced into a portion of a well region 11 (corresponding to the recited semiconductor region in claim 1) located under the N^+ block region 41. As a result, a P-type impurity region (corresponding to the first conductivity type impurity region in claim 1), which is not mixed with a N-type impurity, will be formed in the portion of the well region 11 located under the N^+ block region 41. Flaker neither discloses or suggests a process for obtaining a region formed of only P-type impurities, as it is impossible to arrive at the semiconductor region recited in claim 1 from the teachings of Flaker.

The above argued differences between the semiconductor device defined in independent claim 1 and device of Flaker undermine the factual determination that Flaker identically describes the claimed invention within the meaning of 35 U.S.C. § 102. Applicants, therefore, respectfully

submit that the imposed rejection of claims 1-9 under 35 U.S.C. § 102 for lack of novelty as evidenced by Flaker is not factually viable and, hence, solicit withdrawal thereof.

Claims 1-11 are rejected under 35 U.S.C. § 103 for obviousness based upon Flaker

In the fourteenth enumerated paragraph of the Office Action, the Examiner asserted that one having ordinary skill in the art would have arrived at the claimed invention. This rejection is respectfully traversed.

Although the Examiner rejected claims 1-11, the Examiner only specifically referred to claims 7-9 (dummy regions) and claim 10 (thickness not more than 50 nm). As to claims 7-9, the Examiner took Official Notice that dummy regions would be formed. Although the Examiner can take Official Notice of facts outside of the record, these facts must be of such a notorious character so as to be instantly and unquestionably recognized as "well-known" in the art. See M.P.E.P. § 2144.03. As also discussed in M.P.E.P. § 2144.03, Applicants have the right to challenge the Examiner's assertion as to the officially noticed facts. Upon such a traverse by Applicants, the Examiner is to cite a reference to support the Examiner's position. As such, Applicants hereby request that the Examiner provide a reference regarding the claimed dummy regions. Furthermore, Applicants note that the Examiner must also do more than establish that the prior art discloses dummy regions corresponding to that claimed. The Examiner must also establish that the applied prior art provides a motivation to modify the primary reference in view of whatever reference discloses the claimed dummy regions.

As to the limitations that the thickness of the isolation film being not more than 50 nm, as recited in claim 10, the Examiner asserted that it would have been a matter of routine optimization to arrive at this claimed limitation. The Examiner has apparently applied the oft-used argument that limitations as to shape, size, dimension, thickness, etc. would be obvious as a matter of design choice or routine experimentation. In this regard, the Examiner is referred to M.P.E.P. § 2144.05 II(B), which is entitled "*Only Result-Effective Variables Can Be Optimized.*" As recognized by the courts, prior to asserting that the claimed limitation as to the parameter would have been obvious, the Examiner must first establish that the parameter to be modified is an (a) art-recognized, (b) result-effective, (c) variable.⁵

As (c) implies, the limitation must be variable. As such, the disclosure of a value or range does not establish that the term is variable. There must be some teaching that the limitation can vary from the taught value or range. Pertaining to (b), the Examiner must establish that the prior art gives one having ordinary skill in the art a reason to optimize this variable (i.e., varying the limitation in one direction or another produces an expected desirable result). In this regard, the Examiner must go beyond establishing that varying the limitation produces some random result. A random result is not enough; instead, the result must be recognized by the prior art as desirable.⁶ With regard to part (a), the parameter to be optimized being result-effective and variable must be recognized by the art. The Examiner's statement that

⁵ See, *In re Rijckaert*, 9 F.3d 1531, 28 USPQ2d 1955 (Fed. Cir. 1993); *In re Yates*, 663 F.2d 1054, 211 USPQ 1149 (CCPA 1981); *In re Antonie*, 559 F.2d 618, 195 USPQ 6 (CCPA 1977).

⁶ See *In re Boesch*, 205 USPQ 215 (CCPA 1980). The claim at issue was directed to a nickel-based alloy having multiple constituents with various ranges and also required that the constituents satisfy an equation as to N_V . The primary reference disclosed an alloy having constituents that overlapped the claimed ranges, but the equation as to N_V was not disclosed. The Court, however, relied upon a secondary reference that suggested: "[t]he higher the N_V of a given Co-Cr-Ni alloy the higher the change for the precipitation of embrittling phases." Therefore, the Court reasoned that the secondary reference taught that N_V could be varied and that varying N_V in a particular direction produced a desired result and, thus, N_V was a known result-effective variable.

"such thickness is known to affect the device properties" is not persuasive. The Examiner's assertion must be based upon teachings in the prior art, as the Examiner is not free to create a factually unsupported rationale. There is, however, no evidence of the Examiner's assertion being based on the prior art.

The Examiner, therefore, has failed to establish that the claimed thickness of the isolation film in an SOI structure is an art-recognized, result-effective, variable. Thus, the Examiner cannot assert that optimizing this parameter would have been obvious to one having ordinary skill in the art. Applicants, therefore, respectfully submit that the imposed rejection of claims 1-11 under 35 U.S.C. § 103 for obviousness predicated upon Flaker is not viable and, hence, solicit withdrawal thereof.

Attached hereto is a marked-up version of the changes made to the claims by the current amendment. The attached page is captioned "Version with markings to show changes made."

Applicants have made every effort to present claims which distinguish over the prior art, and it is believed that all claims are in condition for allowance. However, Applicants invite the Examiner to call the undersigned if it is believed that a telephonic interview would expedite the prosecution of the application to an allowance. Accordingly, and in view of the foregoing remarks, Applicants hereby respectfully request reconsideration and prompt allowance of the pending claims.

To the extent necessary, a petition for an extension of time under 37 C.F.R. § 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account 500417, and please credit any excess fees to such deposit account.

Respectfully submitted,

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VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE SPECIFICATION:

Please delete the first two full paragraphs in page 21 in their entirety and replace with the following:

--As shown in Fig. 5, an oxide film 141 of about 20 nm in thickness and a nitride film 142 of about 200 nm in thickness are successively deposited on the SOI substrate for thereafter patterning isolation regions through a mask of a patterned resist film [142] 143 and etching the triple multilayer film of the nitride film 142, the oxide film 141 and the SOI layer 3 to leave the lower layer part of the SOI layer 3, thereby forming a plurality of partial trenches 144.

Then, an oxide film of about 500 nm is deposited so that a structure formed with the partial oxide films 31 and the SOI layer 3 (the well regions 11 and 12) located under the same can be obtained by polishing the nitride film 142 to an intermediate [portion] portion by CMP treatment by a method similar to that in general trench isolation and thereafter removing the nitride film 142 and the oxide film 141, as shown in Fig. 6.--

IN THE CLAIMS:

The claims have been amended as follows:

Claim 11 has been cancelled.

1. (Amended) A semiconductor device having an SOI structure formed by a semiconductor substrate <1>, an embedded insulating layer <2> and an SOI layer <3>, comprising:

a plurality of element forming regions provided in said SOI layer, each formed with a prescribed element;

an isolation film <31> provided in an upper layer part of said SOI layer for isolating said plurality of element forming regions from each other;

a first conductivity type semiconductor region <11, 12> provided under said isolation film as part of said SOI layer, said semiconductor region being formed in contact with at least one of said plurality of element forming [region] regions having a first conductivity type among said plurality of element forming regions; and

a first conductivity type body region <10> provided in said SOI layer and capable of being externally fixed in electric potential, said body region being in contact with said semiconductor region, wherein

said semiconductor region at least partially has a first conductivity type impurity region not mixed with an impurity of a second conductivity type different from said first conductivity type but doped by only an impurity of said first conductivity type.

10. (Amended) The semiconductor device according to claim 1, wherein

said isolation film includes [an isolation film] a portion having a thickness of not more than 50 nm.